

## **REMARKS**

New claim 27 is supported by at least paragraph 19.

### **Claim 1**

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection.

Claim 1 is amended to recite “the substrate is configured to have a thermal conductivity of at least 24 W/m·K.” Applicants have found no such teaching in Dolan.

Regarding a thermal conductivity of at least 24 W/m·K, the Examiner states “because Dolan discloses the same material as the of the [sic] claimed material in this regard, they have the same thermal conductivity.” Applicants respectfully submit that the thermal conductivity of a substrate including multiple layers is not inherent to the material, and depends on the configuration of the substrate. For example, if a substrate contains two highly thermally conductive layers separated by a thermally insulating layer, the overall thermal conductivity of the substrate will be low, despite the inclusion of highly thermally conductive materials. In the specific example of Dolan, Dolan’s ceramic member 12 and copper pallet 14 are separated by an epoxy of unspecified thermal conductivity, and whose thermal conductivity may vary based on how the epoxy is configured. Dolan does not provide enough information to estimate the thermal conductivity of the substrate, therefore claim 1 is not anticipated by Dolan.

### **Claim 2**

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dolan as applied to claim 1, in view of “Applicant’s Admitted Prior Art.” Applicants respectfully traverse the rejection.

Claim 2 depends from claim 1. The Examiner’s analysis of “Applicant’s Admitted Prior Art” adds nothing to the deficiencies of Dolan with respect to claim 1. Therefore, claim

2 is allowable over Dolan and “Applicant’s Admitted Prior Art” for at least the same reason claim 1 is allowable over Dolan.

The Examiner cites paragraphs 2 and 3 and Fig. 1 of the present application as “Applicant’s Admitted Prior Art.” The Examiner states “AAPA discloses that III-nitride light emitters are known and used . . . . Therefore it would have been obvious to one of ordinary skill in the art . . . to use a III-nitride type light emitter layer . . . .” Applicants respectfully note that Fig. 1 shows a device where the contacts are on the same side of the device. In contrast, Dolan requires a contact on the top side of the device and a contact on the bottom side of the device. The Examiner’s rejection does not demonstrate how or whether Dolan and/or “Applicant’s Admitted Prior Art” may be modified such that they may be combined. Claim 2 is therefore allowable over Dolan and “Applicant’s Admitted Prior Art” for this additional reason.

#### **Claim 4**

Claim 4 is rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection. Claim 4 depends from claim 1, and is therefore allowable over Dolan for at least the same reason as claim 1.

In addition, claim 4 recites “at least one lead connected to the substrate.” The Examiner’s rejection states “at least one lead 24 [Dolan] is connected to the substrate.” Fig. 1 clearly shows that anode leads 24 are connected to the semiconductor monolith. Accordingly, leads 24 are not connected to the substrate. Claim 4 is thus allowable over Dolan for this additional reason.

#### **Claim 5**

Claim 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection. Claim 5 depends from claim 1, and is therefore allowable over Dolan for at least the same reason as claim 1.

In addition, claim 5 recites “at least one solder pad connected to the substrate.” The Examiner’s rejection states “at least one solder pad 20 [Dolan] is connected to the substrate.” Column 3 line 11 teaches that structure 20 is “silver epoxy,” not a solder pad. Claim 5 is thus allowable over Dolan for this additional reason.

#### **Claim 6**

Claim 6 is rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection. Claim 6 depends from claim 1, and is therefore allowable over Dolan for at least the same reason as claim 1.

In addition, claim 6 recites “at least one terminated wire connected to the substrate.” The Examiner’s rejection states “at least one terminated wire 24 [Dolan] is connected to the substrate.” Fig. 1 clearly shows that anode leads 24 are connected to the semiconductor monolith. Accordingly, structure 24 is not connected to the substrate. In addition, Dolan’s structure 24 cannot be both claim 4’s “lead” and claim 6’s “terminated wire,” since the plain language of the claims indicates that these are different structures. Claim 6 is thus allowable over Dolan for this additional reason.

#### **Claim 7**

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dolan as applied to claim 1, in view of Kuhnert et al., US Patent 5,379,942, hereinafter “Kuhnert.” Applicants respectfully traverse the rejection. Claim 7 depends from claim 1. The Examiner’s analysis of Kuhnert adds nothing to the deficiencies of Dolan with respect to claim 1. Claim 7 is thus allowable over Dolan and Kuhnert for at least the same reason claim 1 is allowable over Dolan.

Claim 7 recites “a bond disposed between the at least one copper layer and the core is a direct copper bond.” The Examiner states “Kuhnert discloses that a direct copper bond is used . . . [I]t would have been obvious . . . to use this type of bonding to bond the ceramic and

the copper layer of the Dolan reference, since it would save cost by eliminating the use of silver layer 16 in that reference.”

Dolan’s device is made “by first applying the LED monoliths to a metallic pallet, such as a copper pallet, and then securing the pallets to a substrate in a preferred geometrical arrangement.” See column 1 lines 54-57 of Dolan, emphasis added. As described in paragraph 19 of the present application, direct copper bonding requires high temperature processing. A person of skill in the art would expect that the temperature required for direct copper bonding would damage an LED monolith already mounted on the copper layer. Therefore, there is no expectation that Dolan’s device may be successfully modified by Kuhnert’s copper bond. The Examiner has failed to establish a prima facie case of the obviousness of claim 7; therefore, claim 7 is allowable over Dolan and Kuhnert for this additional reason.

#### **Claim 8**

Claim 8 is rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection. Claim 8 depends from claim 1, and is therefore allowable over Dolan for at least the same reason as claim 1.

Claim 8 recites “a bond disposed between the at least one copper layer and the core is an active metal braze.” The Examiner states “A bond 16 [Dolan] disposed between the at least one copper layer and the core is an active metal braze.” Column 2 lines 53 and 54 state that structure 16 is “epoxy adhesive,” not an active metal braze. Claim 8 is thus allowable over Dolan for this additional reason.

#### **Claim 24**

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dolan as applied to claim 1, in view of Kuhnert et al., US Patent 5,379,942, hereinafter “Kuhnert.” Applicants respectfully traverse the rejection. Claim 24 depends from claim 1. The

Examiner's analysis of Kuhnert adds nothing to the deficiencies of Dolan with respect to claim 1. Claim 24 is thus allowable over Dolan and Kuhnert for at least the same reason claim 1 is allowable over Dolan.

Claim 24 recites "the at least one copper layer is in direct contact with the ceramic core." As described above in reference to claim 7, Dolan requires attaching the LED monolith to the copper pallet BEFORE attaching the copper pallet to the substrate. A person of skill in the art would expect the direct copper bond described in Kuhnert to damage an LED monolith mounted on the copper layer. Accordingly, the Examiner has failed to provide a prima facie case of the obviousness of claim 24 and claim 24 is allowable over Dolan and Kuhnert for this additional reason.

#### **Claim 25**

Claim 25 is rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection. Claim 25 depends from claim 1, and is therefore allowable over Dolan for at least the same reason as claim 1.

Claim 25 recites "the semiconductor light emitting device is configured to operate at a current density of at least 50 A/cm<sup>2</sup>." The Examiner states "the operating of the light emitting package at the claimed conditions, is inherent to the structure of Dolan, since Dolan discloses all the structural claimed limitations." Applicants respectfully submit that a person of skill in the art would appreciate that state-of-the-art light emitting devices at the time Dolan was filed generally operated at lower current densities than state of the art devices at the time the present application was filed. In addition, the Examiner's rejection is akin to saying a claim of "an engine configured to operate at 300 horsepower" is inherent in a recitation of "an engine." It is simply not so. Claim 25 is therefore allowable over Dolan for this additional reason.

#### **Claim 26**

Claim 26 is rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection. Claim 26 depends from claim 1, and is therefore allowable over Dolan for at least the same reason as claim 1.

Claim 26 recites “the semiconductor light emitting device is configured to operate at an electrical power consumption of at least 1 W.” The Examiner states “the operating of the light emitting package at the claimed conditions, is inherent to the structure of Dolan, since Dolan discloses all the structural claimed limitations.” Applicants respectfully submit that a person of skill in the art would appreciate that state-of-the-art light emitting devices at the time Dolan was filed generally operated at lower power than state of the art devices at the time the present application was filed. For example, paragraph 6 of the present application teaches that historically, LEDs have operated at low power, for example, less than 300 mW. In addition, the power at which a semiconductor light emitting device is operated may depend on many factors, including the configuration and the size of the device. Accordingly, a semiconductor light emitting device configured to operate at an electrical power consumption of at least 1 W is not inherent in the teachings of Dolan. Claim 26 is thus allowable over Dolan for this additional reason.

**Other dependent claims**

Claims 3, 14, 16, and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Dolan, US Patent 4,566,170. Applicants respectfully traverse the rejection. Claims 3, 14, 16, and 17 depend from claim 1, and are therefore allowable over Dolan for at least the same reason as claim 1.

Claim 9 is rejected under 103(a) as being unpatentable over Dolan. Claim 9 depends from claim 1, and is therefore allowable over Dolan for at least the same reason as claim 1.

Claims 10-13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dolan as applied to claim 1, further in view of Whitworth et al., US Patent 6,642,550. Claims

10-13 and 15 depend from claim 1. The Examiner's analysis of these claims adds nothing to the deficiencies of Dolan with respect to claim 1. Claims 10-13 and 15 are therefore allowable over Dolan and Whitworth et al. for at least the same reason claim 1 is allowable over Dolan.

In view of the above arguments, Applicant respectfully requests allowance of all pending claims. Should the Examiner have any questions, the Examiner is invited to call the undersigned at (408) 382-0480.

Submitted Electronically

Respectfully submitted,

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